A Systemic View of Government in Market Governance: Lessons learned from the California electricity crisis.

Author's Information

Kimberly Samaha
Principal
AMP Consulting
4 Rue du Bois de Boulogne
92200 Neuilly sur Seine
France

Tel : 33 (0)6 75 74 19 94
Email : kimberlysamaha@yahoo.com

Author's Biography

Kimberly Samaha has worked in leadership roles within the deregulating US energy market for the past 15 years. A majority of her work was within the highly volatile climate of the CA energy market. Kimberly headed up two key companies leading entrepreneurial change in the energy sector. First as the COO of New Energy Technologies, a leader in the market driven retail choice program, and subsequently as the President of Catalyst Power, an ABB company, focused on distributed energy. She is a vocal proponent of policy driven programs and privately hosts biannual international colloquiums in Bordeaux, France, where multidisciplinary participant gather to addressing key energy market issues.

Kimberly currently lives in Paris, France where she heads an organizational consulting company, AMP, serving multi-nationals in the energy sector. She is also concurrently working on a PhD. in human and organizational development at the Fielding Institute in Santa Barbara CA.

A Systemic View of Government in Market Governance: Lessons learned from the California electricity crisis

Kimberly Samaha

Abstract

The "deregulating" of the electric utility has dramatically changed the role of government in its regulatory oversight. Various market designs and governing frameworks have been adopted by states within the United States with mixed results. The newly opened electricity market has seen moderate success in some markets and a publicly unacceptable rate of catastrophe in others (California and the Enron debacle being the leading examples).

Using a framework derived from the theories of Complex Adaptive Systems (CAS), this paper will explore the dynamics of interdependency, feedback loops and emergent properties that emerge in a social systems undergoing dramatic change. The basic principles emphasized in the dynamic nature of interconnected governance systems will be grounded in the real life example of the CA energy crisis. Special focus will be paid to the government's initial intent, how it handled governance during the energy crisis in 2000-2001.

Keywords: electricity, restructuring, regulatory policy, systems thinking, governance

A Systemic View of Government in Market Governance: Lessons learned from the California electricity crisis.

Kimberly Samaha

Introduction:

The traditional role of public policy and management has changed fundamentally at the local, state, federal and global levels. The era of government jurisdiction based on separate and autonomous entities has been replaced with an intergovernmental and intersectoral network of industry, regulators, special interest groups and individual citizens. This decentralized networked oversight system coupled with the complexity and uncertainty of newly reformed markets has given new meaning to 'chaos theory'. Everything seems in motion. And Change, in its extreme form, has become the overriding theme.

In this new context, government's role in corporate governance is undergoing what evolutionary biologists call anagenesis: a sudden, qualitative shift in evolutionary development. This anagenesis was first triggered by the 'globalization' wave of the Thatcher-Reagan administrations. Their promotion of free market ideals created a worldwide movement within the public and private network industries to move government out of the way and usher in competition under the broad banner of 'deregulation'. This new era of globalization operates through a web of tightly connected, loosely regulated networks. The prevailing force of interconnectedness has manifested its societal effect through the emergence of massive Internet and communication networks, international finance and monetary flow, multinational corporations and brand homogeneity, and interregional trade blocs.

Globalization has also created a far different environment for administration and decision-making in public sector governance. Interconnectedness dramatically contracted geographic and social distance, which in turn increased the dynamic of interdependence. Government and its regulatory institutions have traditionally depended on a reality of separate, independent administrators and policy systems. Under the effects of the new paradigm, public sector officials are finding the simple distinctions between borders, cultures and political ideologies are increasingly blurred, forcing them to manage and lead in an environment of augmenting complexity and turbulence.

The California Energy Crisis of 2000-2001 is a perfect illustration of the consequences of the systemic changes that occur in opening tightly controlled regulated industries, such as the electric utility industry, to the dynamics and complexity of free market competition. In the United States, California was one of the first states to push for radical reform of their electric utility industry. The ideals of deregulation soon gave way to a more conservative form of restructuring resulting in a complex and still highly regulated scheme. The nonlinear characteristics of this new multivariable structure manifested themselves in an industrial, financial and political crisis that many have termed ‘the perfect storm’.

This paper will evaluate the California energy crisis, using framework derived from the theories of Complex Adaptive Systems (CAS). The basic ‘system theory’ principles of interdependency, feedback loops and emergent properties will be grounded in the real life example of the California energy crisis.

The Background:

California began to consider deregulation of its electricity market in the early 1990’s. The original plans were drafted in response to the strong criticism that high electric prices were hurting the State’s large industrials and curbing new business investment in the State. Before restructuring, California’s electricity supply was provided by three large private investor owned utilities (IOU’s) and a mix of municipal power companies, owned by cities and counties. Over 70% or roughly 20 million Californians were served by the three IOU’s in the $20 billion electric services market (Smeloff and Asmus, 1997). The generally held belief was that electricity prices were high in California, partly because of the regulated market, which afforded utilities a high rate of return on their investments.

Effects of ‘deregulation’ in other industries such as telecommunication, airlines and gas, had sufficiently proved the point that competition and open markets lowered consumer prices. Deregulation as defined by the electric industry meant removing the monopoly controls on prices and allowing the entry of competing suppliers. Removing regulation was never the intent as the transportation functions (transmission and distribution) are accepted natural monopolies. Competition in the electric industry only applies to the generation of electricity and the commercial functions of selling electricity at the wholesale and retail level. What came to be termed “deregulation” was actually an attempt to restructure the market and secure the benefits of competition, thus lowering electric prices.

The prescription of restructuring followed a basic formula that consisted of breaking up the vertically integrated, state-regulated monopolies to create more wholesale suppliers and by giving retail customers the choice of power suppliers. The expected benefits of opening the wholesale and retail commodity markets to competition were twofold: pricing becomes more efficient and costs are lower. The ideal sales price is set at the efficient level and is beyond the influence of the utility, giving maximum incentive to reduce costs and innovate as the only ways to increase profit. This ideal is only realized where there are many new competitors to avoid collusion among firms and the exercise of market power.

In April 1992, the California Public Utilities Commission (CPUC) initiated a review of trends in the electric industry. A continued set of hearings and public hearings lead to a final CPUC restructuring Order issued in December 1995, often referred to as "the preferred policy decision". The plan expected that both regulated and competitive retail utilities would coexist and the wholesale prices would be kept 'just and reasonable' by the discipline of competitive market forces. This set of regulatory changes promised to fundamentally change the electricity system from one that is strictly regulated - to one in which market forces would play the primary role.

The final bill known as the Electric Utility Industry Restructuring Act, AB 1890, was unanimously passed in September 1996. AB 1890 was meant to be strictly a framework, not a detailed design for system implementation, which left market participants with many complex and divisive issues to work out. Final regulation went to great lengths to specify how participants could interact within the market structure, including**:**

- Prohibition of long term competitive contracts for investor owned utilities
- Mandatory purchasing of electricity through power exchange (PX) with bidding rules that require paying the highest bid price
- State mandated sale of utility generation assets
- Retail price caps, mandating a 10% rate cut, which eliminated the markets ability to respond to supply and demand pricing dynamics
- Mandated recuperation of utility stranded costs, which created financial barriers to new competitors entering the market
- An exemption to government owned utilities from buying and selling power exclusively through the PX

In reality, the final plan for "deregulating" the California energy market was a far more complex "re-regulation" plan. Instead of removing controls, the restructuring actually created an entirely new system; a new centrally planned market, loosely combing free market theory with political imperatives.

<u>The Outcome:</u>

The competitive market for wholesale power was opened in April 1998. The first 18 months of operation went relatively smoothly. Wholesale prices of electricity declined, customers benefited from the rate decrease and utilities were able to pay off their stranded costs. The system was put to a test starting in the spring of 2000 when prices began to jump dramatically, triggering the period now referred to as "the energy crisis". The crisis was in full force by the summer of 2000 with soaring electricity prices in the San Diego area and it soon spread statewide. By early 2001, wholesale prices were ten times higher than normal, consumers experienced numerous rolling blackouts and two of the three State investor owned utilities proclaimed insolvency.

The industry crisis rapidly provoked a full-scale political crisis. The blame game began and consumers were looking to the government to intervene and "fix" the problem. At the direction of the governor, the state began to take steps to secure electricity supplies and stabilize prices. The state assumed the central role of purchasing wholesale power on behalf of the insolvent private utilities. It also moved toward establishing a state-owned utility that would not only buy power but also would own an extensive transmission grid and build new generation plants.

State government took the position that the main problem was market manipulation and advocated wholesale price caps. The state, however, did not have jurisdiction over wholesale prices and spent many months convincing the national regulatory body FERC to order wholesale price caps. FERC on the other hand, advocated the problem to be the poor market design, in particular the use of retail price caps. FERC strongly advocated the market principles that claimed true competition would level the pricing field if allowed to operate correctly. In the middle of a crisis situation, the two regulatory bodies were enmeshed in an ideological debate, preventing the two from working together. In the end both California regulators and FERC relented, adopting a policy of compromise. The CPUC ratified two price increases of historic proportions: one of 10 percent in January and a second larger increase averaging 46 percent in March. At the federal level, FERC switched its antiregulatory stance and imposed effective regional price caps on June 19, 2001 (Weare, p. 46, 2003).

Even with these measures the State spent $9.5 billion from its general fund in the first seven months (recouping only about $1.5 billion from reselling that power to utilities) and had to float a $13.4 billion bond to cover the costs. It entered into $45 B in long term (up to 20 years) contracts with generators (Congressional Budget Office, 2001). To put these numbers into perspective, the $45 billion bill incurred by the State was the equivalent of 3.5 percent of the yearly total economic output of California. The Savings and Loan debacle was considered a staggering deregulatory failure, but its total cost of about $100 billion amounted to only one half of 1 percent of the total U.S. economy (Weare, 2003).

By the summer of 2001, the California energy crisis was over. Blackouts ceased and wholesale prices returned to their pre-crisis level. The sudden reversal in the situation should have been obvious to see from a fundamental economic perspective. The supply shortage moved out of the critical range with more capacity made available through fast track regulatory processes. The number of unscheduled outages of generating plants dropped and customers responded to the State's plea to reduce demand. Even though the summer of 2001 was on average hotter than the summer of 2000, electricity demand decreased considerably (8.4%) (Weare, 2003, p. 53).

The financial crisis abated but it did not end without a high price to pay. California energy users saw prices jump 40% over pre-deregulation rates and may see tax increases to cover the remaining debt incurred. The state had responded to the crisis by directly intervening in the market and in essence returning to a closed, centrally planned, vertically integrated system. California's blunt solution to the energy crisis has submerged it into many of the same problems that deregulating was intended to solve. This search for simple answers missed the intricacies of the overall systemic failure of the initiative. Understanding how the system operated as a whole and the dependency of the interconnections inherent in the system may shed light on a number of factors and possible solutions.

System Dynamics- Prior to Deregulation

Electricity sectors worldwide evolved with vertically integrated geographic monopolies that were either publicly owned or subject to public regulation of prices, service obligations, major investments, financing and expansion into unregulated lines of business (Joskow, 2003). The classic structure of vertical integration included controlling the physical functional areas of generation, system operation, transmission and distribution. Utilities built their own generating plants and coordinated all aspects of making and delivering electricity.

Nationwide, utilities were established as monopolies given a geographic service area to exclusively serve. Their prices and operations were regulated at the state level with an agreed upon focus to have enough electricity to serve all of their customers all of the time. The states' Public Utility Commission (PUC) approved the retail prices that private utilities could charge for electricity and oversaw the reliability of their service. The Federal Energy Regulatory Commission (FERC) was responsible for approving wholesale prices that electricity producers could charge utilities for power and the rates that utilities could charge for the use of their transmission lines.

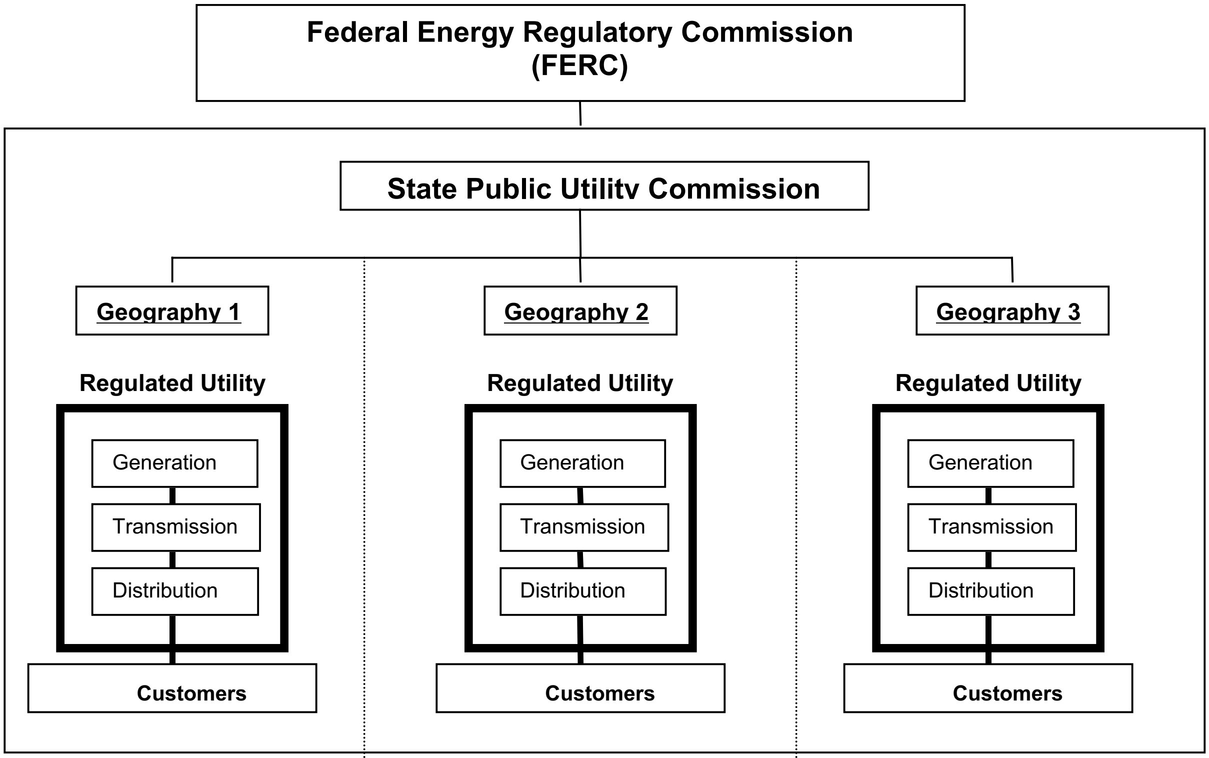

Figure I: vertically integrated electric utility system

Inherent in this market structuring was the ability to create boundaries and fix variables to constants, creating an essentially 'closed' system. With many variables held constant, the system exhibits near-linear dynamics enabling cause and effect relationships to be established, creating predictability. Policy making under this traditional system was relatively straightforward, where both the needs of the consumer and the investor were met. Customers used regulators to protect from the utilities potential exploitive power, where utilities used regulators to protect the future profitability of their large sunk investments. The private utilities were allowed to charge prices that recovered their costs of production and gave investors a large enough return to attract capital for the building of new infrastructure. This formula worked quite well while new demand continued to outpace supply.

By the 1970's, however, most of the infrastructure in the US was completed and rapidly increasing demand was tapering off with the introduction of energy conservation programs. In addition, the national movement toward nuclear power and the formation and subsequent mandates of the Environmental Protection Agency (EPA) meant for the first time utilities marginal costs, the cost for producing additional power, became higher than average costs. The utilities were faced with growth forecasts that were shrinking from an annual 7-8 percent to a low average of 2 percent (Smeloff & Asmus, 1997).

This stall in the growth dynamic brought to light the negative phenomena of closed systems, scientifically known as entropy. In physics, entropy derives from the second law of thermodynamics and states that energy is dissipative in nature and any isolated or closed physical system will precede the direction of ever increasing disorder. Any closed system will eventually settle into a state of equilibrium, run down, stagnate, lose its energy and cease to exist. Applying this concept of entropy to the relatively closed system of regional utility monopolies sheds some light on the industry's subsequent behavior.

Utility executives faced with the reality of stalled growth, began to increase in size through mergers and acquisitions, ushering in a stage of market consolidation. Instead of building new plants in isolation, many utilities invested jointly in remote plants, began sharing transmission lines and creating a new level of interconnection and interdependency. The system began to open up, bringing with it a new order of complexity.

Electricity systems are by design, complex, interdependent systems. Decisions concerning generation, transmission, distribution and the delivery of inputs such as gas must be coordinated in real time under tight constraints of reliability. California's electricity market is currently part of a larger, interconnected electricity grid called the Western Interconnect. The Interconnect comprises 11 western states (as well as parts of western Canada and northern Mexico) that effectively constitute one large market for electricity. What happens to supply or demand in one part of the region will influence prices in other parts. California is a net importer of electricity and is highly dependent on sufficient over-supply within the Western system.

In this new highly interconnected reality, the California PUC had no authority over municipal utilities in the state, utilities in neighboring states, federal power agencies or interstate transmission companies - all of those entities were subject to local and federal controls. When the call for deregulation came and its authorship was given to the PUC, it found itself in the position of trying to isolate only a part of a complex highly interconnected system to radical change while the rest of the system was supposed to maintain status quo.

System Dynamics after Deregulation

The overriding reform goal of 'deregulating' the electricity sector was to create new governance arrangements that would provide long-term benefits to consumers. These benefits would accrue by relying on competitive wholesale market for power to provide better incentives for controlling capital and operating costs, to encourage innovation and to shift risk to suppliers and away from consumers. Retail competition or consumer choice would allow consumers to choose the supplier offering the price-service-quality combination that best met their needs, and competing retail suppliers would provide an enhanced array of retail service products, risk management, demand management and new opportunities for service quality differentiation based on individual consumer preferences (Joskow, 2003).

Joskow describes the basic architecture for transitioning to competitive electricity markets involves several key components:

a. Vertical separation of competitive segments (generation, marketing and retail supply) from regulated segments (distribution, transmission, system operations) either structurally (through divesture) or functionally (with internal “Chinese” walls separating affiliates within the same corporation.)
b. Horizontal integration of transmission and network operations to encompass the geographic expanse of “natural” wholesale markets and the designation of a single independent system operator to manage the operation of the network, to schedule generation to meet demand and to maintain the physical parameters of the network so that the lights would stay on except under extremely rare conditions.
c. The creation of wholesale spot energy and operating reserve market institutions to support requirements for real time balancing, to respond quickly and effectively to unplanned outages of transmission or generating facilities and to facilitate economical trading opportunities among suppliers and between buyers and sellers.
d. Creation of institutions to facilitate access to the transmission network by buyers and sellers to facilitate economical production and exchange including mechanisms efficiently to allocate scarce transmission capacity.
e. Horizontal restructuring, forward supply commitments and behavioral rules to mitigate regional and localized market power in wholesale markets
f. Unbundling retail tariffs to separate retail power supplies and associated support services to be supplied competitively from distribution and transmission services that would continue to be provided by regulated monopolies
g. Requiring retail consumers to purchase their power supplies from the competing retail suppliers who in turn buy their power in wholesale markets or own generating facilities to support their retail supply commitments.

The new market design disintegrated the closed vertically integrated system of the regulated monopolies and replaced it with an open highly adaptive system that operated at an entirely new level of complexity.

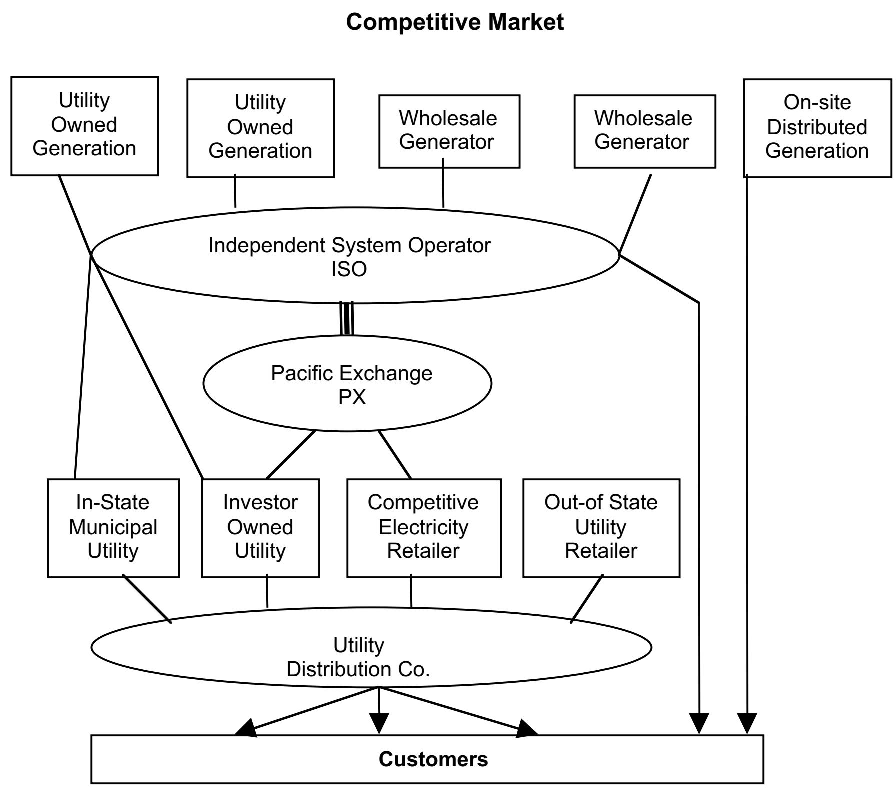

Figure II: distributed open market electricity system

This new open system was multivariate, without one central controller. It was a distributed system, which constantly processed a variety of inputs and discharged a variety of outputs in real time. Complex open systems maintain themselves far from equilibrium and find a steady state only characterized by a dynamic balance of continual flow and change. A system undergoing such dramatic change oftentimes exhibits non-linear dynamics, meaning the result of an action on a system's part may or may not be responsive to its cause. Outcomes are highly unpredictable; meaning a slight increase in intensity somewhere in the system may lead to an unexpectedly large increase in response.

The design of opening the California energy system followed an approach known as 'shock therapy'. The previous system operated with many fixed variables and a relatively straight forward rules and reward system. The new system introduced unknowns at many levels and the key focus shifted from a Cartesian approach of adding up the sum of the parts to a systems approach of focusing on the effect of the systems interconnections.

Systems' thinking at its root is contextual in opposition to analytical. The key is to place subsystems in the context of a larger environment in which they are a part of and study the role they play in the larger whole. Systems can be thought of as big nets where there is a network of connections between subsystems. The subsystems act as building blocks for higher more evolved levels. In this context, the California energy system needs to be explained in terms of its environment, its boundaries and its patterns of interconnectedness and their relationship to other systems within the network.

The restructuring design of the California energy market system did not employ a systems approach but followed classic Cartesian thinking and broke the system into five distinct parts. Each part was treated individually in regards to its structuring, geographical reach and regulatory oversight.

Functional Area	Competitive or Regulated	Geographical Constraints	Governing Organization
Generation	Competitive	Open	FERC PX
Transmission	Regulated	State – ISO Regional – RTO	ISO/RTO FERC/EOB
Market	Competitive	State -PX	PUC
Retail	Competitive	Open	Unregulated
Distribution	Regulated	State	PUC

Table I: Functional areas of the electricity market

The fundamental focus of interconnection of the parts was essentially overlooked and the non-linear dynamics of this open system were severely underestimated. While non-linear systems can sometimes yield chaos, they always breed complexity. Compounding the daunting technical challenges in the newly designed system was the human and political challenges. A system is ‘adaptive’ if its agents change their action as a result of their interaction with the environment. There is an autonomous nature to ‘adaptive’ systems in that they continuously self-organize and evolve, oftentimes emerging or mutating into new and different variations. (Milton, 2003).

The California energy system was an ideal model of a complex adaptive system (CAS). The regulatory function of State Public Utility Commissions (PUC’s) created self-stabilizing feedbacks to correct and compensate for deviations from established norms. The regulators governed through instituting rules and oversight boards to prevent any potentially corrupt behaviour from the market participants. As the California system opened up the governing role of the state government changed significantly. The need to prevent corrupt behaviour did not disappear through the magic of free market dynamics. Quite the contrary the need for additional regulatory oversight increased substantially.

The debate over the exact causes of the California energy crisis has produced many linear cause and effect reasons and assigned them to various culprits to take the blame. Undeniably many factors led up to the ultimate inevitability of the energy crisis in California. However a new look at these variables from a system's perspective reveals certain critical points that caused the system to destabilize. The identifiable variables are:

- Weather patterns such as a drought in the Northwest, thus the reduction of available hydroelectric power and extreme heat in the Southwest with the subsequent hike in natural gas prices and reduced power imports
- Market design prohibiting utilities from hedging risk was fundamentally flawed
- Environmental regulations limiting run hours or adding significant operational costs to existing plants
- Price caps eliminated incentives for consumers to conserve power
- Inability to hedge risk by eliminating utilities ability to enter into long term contracts
- Market manipulation and 'gaming the system' by private generation and trading companies
- Transmission grid in California became dangerously strained

Mapping this causes into an integrated system reveal how the combination of opening and shutting the pricing mechanisms essential to the system's ability to transform and self-organize.

System Dynamics
During the California Energy Crisis

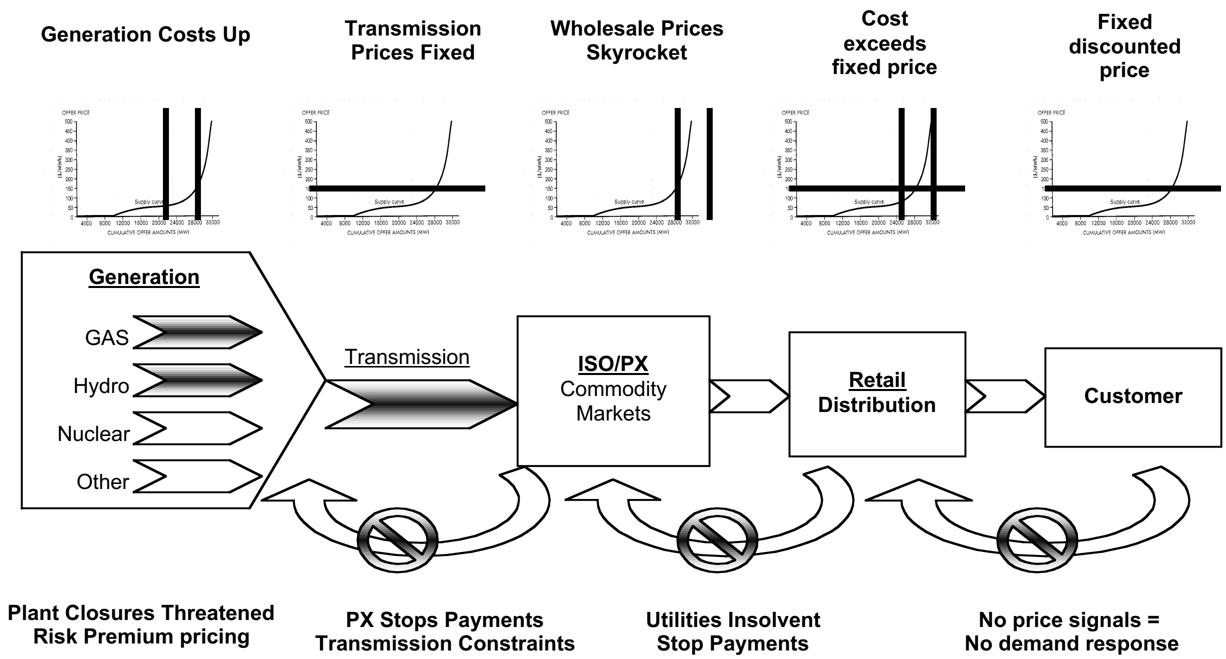

Figure III: system dynamics during the California energy crisis

This newly created system was exponentially more complicated than the original structure and it required time to find a new point of equilibrium. The fundamental problem in California was the necessary period of volatility and instability that precedes a systems evolution. It is in an open system's non-linear nature, which allows the system to build upon itself and emerge. The phenomenon of emergence takes place at critical points of instability that arise from fluctuations in the environment amplified by feedback loops. Feedback is directional by nature. It is called negative or regulatory feedback when it creates a relatively predictable decrease in the direction of change. It is considered positive or self-reinforcing when change is relatively indeterminate and can quickly amplify resulting in run away effects.

The process of changing from a closed regulated system to an open competitive system was an evolutionary experiment. The thrust of evolution is oftentimes driven by the volatile nature of positive feedback. The regulators in California had envisioned a market transformation with an orderly succession of transitions and a great deal of flexibility at each level. The system certainly required stability at the various regions in order to undergo qualitative change, but the balance of positive and negative feedback was stunted by the politics in the system. Most importantly are the feedback loops of pricing signals, where the imposition of price caps blocked the regulatory feedback throughout the system.

Nobel prize winning physicist, Illya Prigogine, studied open chemical systems far from equilibrium. His major contribution to the field of science is also applicable to social systems. He found that in classically closed systems, where many variables are held constant, fluctuations play a minor role. In open systems far from equilibrium, minor fluctuations accelerate and generate significant changes in spatiotemporal structure (Daneke, 1999). He found order to come through these fluctuations, which he called symmetry breaking bifurcations. A more careful look at four critical bifurcation points in the California energy system illustrates this dynamic.

1. Real-Time Nature of Electricity

Electricity is arguably the only commodity that cannot be effectively stored. To handle the schedules of electricity to be generated, sent over limited transmission systems and delivered to millions of points with constantly changing load demands is a daunting task. Add to the complexity the real-time nature of the electricity and its large dependence on weather, and the wholesale market promises to continue to be highly volatile. Capacity limitations of electricity generation implied that if the system were to approach capacity, marginal costs would increase sharply and all spot sales of electricity would sell at a price equal to this marginal cost.

This system dynamic creates a dangerous bifurcation point. When the system is near capacity a very small difference in requirements for electricity could lead to a very large in the spot wholesale price. Wholesale markets work reasonably well when demand is low to moderate, generating resources are not too highly concentrated and there is little congestion on the transmission network. The challenge arises during a relatively small number of hours each year when demand is high creating an inelastic market and high transmission congestion.

The performance of market institutions under these tight supply conditions is highly strained, requiring system operator discretion to balance the network's physical parameters to an acceptable level. It is also during these conditions when prices reach astronomical highs reflecting competitive scarcity conditions. The design of the wholesale market greatly determines the opportunities individual suppliers have in moving prices significantly.

2. Market Design

Given the nature of electricity, a market must be designed to account for the technical limitations. The California electricity market had two basic markets: the day ahead market and a real time market. Some generating plants, such as coal and nuclear, have very long and very costly periods of ramping up from no capacity to full capacity. These plants can be most profitable if they can schedule and sell their load as 'base load' in advance and concentrate on maximizing operations. Other plants such as gas-fired turbine plants can be ramped up relatively quickly and can offer pricing at any hour. In California these two markets were separated through the PX and the ISO, leading to market behavior that increased prices and reduced the systems efficiency

The natural buying patterns for retail utilities would be to enter into long-term contracts directly with generating plants and purchase their short term needs on the spot market. The California regulators, fearing the incumbent utilities market power, forbid the use of long-term contracts. The utilities were forced to make all of their purchases through the PX on short-term basis. This fundamental flaw ran counter to both the financial and technical reality, creating a bifurcation point where highly erratic behavior was encouraged. Generators, particularly those able to play the hour-by-hour market were in an irresistible position to take advantage of the flaws in the system.

3. Market Power and Gaming the System

Market power has been a major focus in deregulating electricity markets. In competitive market theory, it predicts that firms will sell their goods at a price equal to their short-run marginal costs, the variable cost of producing the last unit produced for the market. Unlike other industries in which firms' costs are not publicly available, these costs are known for electricity generators because of the history of rate regulation and ongoing environmental controls. When demand increases and supplies tighten, generating firms have increasing amounts of market power leading to higher markups over competitive price levels (Weare, 2003, Borenstein et al., 2001).

The natural causes that lead to an electricity shortage would have caused electricity prices to rise. However, there is little doubt that the bidding strategies of the electricity generators amplified prices beyond a reasonable level. The theory that a firm always bids to provide a commodity at marginal cost depends on the assumption that the participants bid competitively, taking into account expected prices and not attempting to change them. However, given the market design in California, a generator would have an incentive for increasing prices.

New supplies cannot be made available quickly because electricity cannot be easily stored, its transportation is limited by the constraints of the transmission grid and the construction of new capacity entails long lead times. Consequently, generators do not have to worry that new supplies will flow into the market, undercutting their high bids. The increase in price can be so large that a single firm that owns several plants can profit from shutting down one plant. Even if its competitors do not cooperate, the lost profits resulting from scaling back production in one plant can be more than offset by the large price increase received for selling power from their other plants (Weare, 2003, Joskow, 2001).

Enron's trading strategies are exemplary of how an open market can be easily manipulated, as capital flow is virtual, even though the commodity is physical. In one strategy, Enron played the California market against regulated transmission in neighboring states. It would claim to ship energy through California counter to the direction of congestion, thereby collecting payments for congestion relief. It would then sell that power back to the original location through regulated transmission in neighboring states. No net energy was moved or congestion relieved, but Enron profited from the spread between California congestion payments and tariffed transmission charges (Weare, 2003, p.48).

The system dynamics created a significant risk that firms could and would exercise market power in the manners described above. In California, the combination of high input costs and the requirements for plant shut-downs (air-permits & maintenance), created a market particularly susceptible to manipulation. Whether generators deliberately withheld generation or the system was truly experiencing scarcity rents (when the system reaches its capacity, supply is fixed and demand drives prices exotically high), is still a point of contention. The dynamics of an open market dictate that the players will maximize profits and with the transparency of pricing, an exchange that pays highest price and the inability to react in real time to supply shortages, guarantees that the electric market will continue to be susceptible to market power.

4. Retail Price Cap

Governor Gray Davis' political promises not to raise retail-pricing levels lead to the fourth and fatal bifurcation point. The cap on consumer prices disabled a central adjustment mechanism. Typically, production costs are translated through wholesalers and retailers into consumer price increases, which motivates reductions in demand. This self-correcting feedback loop translates lower demand back to lower prices at the wholesale level. With consumers completely unaware of the need to reduce demand in response to increasing prices, the risks associated with large wholesale price increases was amplified.

The natural economic process of open competitive markets was further stunted with the guaranteed rate decrease. The automatic 10 percent rate decrease and protective rate freeze dulled consumers incentive to change providers, undermining competition. New entrants found it difficult to undercut the utilities prices and could offer few value-added services to justify a higher price. The effect of the rate freeze was the most pronounced when prices began to experience the reality of volatility in the spring of 2000. Customers flocked back to utilities in essence putting new market entrants out of business.

The final blow to the financial solvency of the IOU's was a direct result of this flaw in the system dynamics. With wholesale costs soaring higher than retail prices, negative margins were piling up. Normally a company in this situation would cease selling in the market. The utilities were still held to the public good responsibilities, which forced them to continue to keep the lights on, putting them in an untenable risk-bearing position. This spiral of losses lead to defaults on payments to generators who in turn raised prices further to cover the risk premium they incurred in selling to insolvent entities. By the time the State stepped in to assume control over the situation, wholesale prices were at their justifiable peak.

Summary:

The California market system did not reach order through its fluctuations. The necessary system of positive and negative feedbacks were stunted causing the system functioning to break down. Resilience to transformation was built in through politicians and special interest groups, trying to lock in the sense of security and certainty that was part of the static regulated system. The result was that the existing norms of the regulated regime were reproduced versus absorbed into the emergence of a new order. A summary of the subsystems and their critical bifurcation points is provided below:

Regulated Market	Functional Area	Competitive Market	Critical Bifurcation Points
-Utility owned assets -Seasonal scheduling -Guaranteed investments	**GENERATION**	-Multiple asset owners -Daily/Hourly scheduling -High risk investment	-Few new plants built -Real time scheduling: a. Limits competitors to gas fired turbine plants b. Creates unpredictable maintenance downtimes
-Utility owned transmission -Voluntary membership in Regional Transmission Organization (RTO)	**TRANSMISSION- ISO**	-Transmission system open to all generators and out-of state utilities- free wheeling -Mandatory coordination through ISO	-Wheeling of non-state power overburdens transmission system -ISO compete with PX in day-ahead and hourly auctions- inviting gaming of the system -No financial incentive or responsible party to build new infrastructure
-No formal commodity market existed -Long-term Contracts for additional supply	**MARKET - PX**	- Mandatory use of PX for IOU's only -Prohibition of Long-term contracts for IOU's only	-Market structure encourages manipulation & gaming -Unhedged financial risk for IOU's

-All services, billing, maintenance bundled -Monopoly geographic territories -Known # of customers makes planning possible -Public service, environmental & DSM programs part of tariff	**DISTRIBUTION**	-Utilities still responsible for all billing, metering & maintenance -# of customers changes daily -Competitive rates make DSM & green programs unattractive	-Metering & billing confusion hurts new entrants & switching customers -DSM programs as a safety valve in supply and demand are ignored
-Retail services were bundled into distribution	**RETAIL**	-Many new entrants -Little value added services available -Difficult for consumers to differentiate between competitors	-Retail price cap makes market dynamics dysfunctional -Guaranteed discount and stranded cost recuperation leaves little room for real competition

Table II: bifurcation points in the competitive electricity market

The newly restructured system was a politically designed system. The non-linear dynamics associated with an open system manifested themselves at identifiable bifurcation points creating what has been called the “perfect storm”. The high risks were not inherent to the economic system but were the results of definable design flaws in the regulatory system. Neither the regulatory agencies nor the major utilities understood how radically their roles had changed when the market deregulated. All parties missed the paradigm shift to the complexity unleashed in an open competitive market.

Role of Government in Corporate Governance

Governmental jurisdictions have traditionally had their own separate and distinct identities, each with its own internal governance structure and their own legal and jurisdictional bounds. Human beings, nation-states, public organizations agencies and departments are all seen as separate units whose actions and policies can be individually developed in isolation from other considerations. Policy initiatives, management models and decision systems have been designed to address narrowly defined problems, creating solutions that treat problem areas in isolation.

Problems within a highly interconnected industry have created pressing social, technical and economic problems that defy boundaries. Separation is no longer appropriate because governing agencies are no longer totally autonomous, self-reliant entities. Public sector leaders and managers now operate in an increasingly complex environment in which they are expected to find the “right” answers to problems that have many possible answers, none of which will be “right” to everyone involved.

There is a high degree of mutual dependency, where the actions of one individual or agency send rippling effects throughout the system as a whole causing effects that are often highly unpredictable. This complexity and uncertainty combined with the old methods of linear cause and effect decision-making has caused many managers to prematurely manage the symptoms while ignoring the systemic causes. Continuing with these old methodologies has lead to the spread of policy paralysis that seems to dominate so many government agencies.

The electric power industry in the U.S. has been historically regulated by the states. Unlike other countries that have embraced 'deregulation', the U.S. has no clear national laws or national policies addressing a competitive market for electricity. In most other countries, deregulation has been bundled with the privatization of state-owned assets, clearing the messy issue of government taking of private property.

Instead the U.S. has relied heavily on individual state initiatives and efforts by FERC to use its limited authority to encourage states to create competitive markets. FERC has had to rely on a variety of alternative regulatory and institutional arrangements and various regulatory carrots and sticks to provide incentives for cooperation with the states. These institutional and political realities have significantly complicated the kind of industry restructuring that is necessary for effective implementation of what is already the very significant technical challenge of creating a well functioning competitive market for electricity.

One of the undeniable trends in the emerging competitive marketplace for electricity is the role of state governments in decision making about new resources is being weakened. Instead, state regulatory agencies are looking to market participants such as utilities to make decisions about when to invest in new power plants. In the recent past, it has been state PUC's that have wielded the most clout in electricity matters. As market forces displace the need for state oversight, decision-making could filter further down to the community or individual customer level.

While it is an appealing idea to think that industrial, commercial and residential customers could successfully negotiate lower prices for electricity if government would simply get out of the way, the reality is that government certainly has a key role to play in setting the policies and guidelines to oversee industry. Their role must also be interconnected with industry and end-use consumers in order for the true effect of reforms to be realized. In California the discussion of alternative institutions was polluted by an unfortunate overtone of ideological rhetoric that attempted to characterize the debate about wholesale market institutions as one between "central planners" and "free market" advocates. (Joskow, 2003).

The underlying trend that drove the movement of deregulation was that markets worked better than government regulation. With a view that markets are the paramount objective from which other benefits will flow, many policy decisions were made supporting the creation of markets as the goal and not the tool.

The National Council on Electricity Policy (2003) posed the fundamental question of policy goals for deregulating the electric industry as follows:

1. Should competition be encouraged for all consumers because of its potential long-term benefits? Competition implies that consumers face both the upside and downside risks and that those risks encourage them to make choices or
2. Should states shield consumers from risks and keep prices low, thus removing the motivation for consumers to participate in competitive markets.

Viewed systemically, the California energy policy resulted from an environment where economic, environmental and social problems formed a layered filter. Each new problem became linked to every other problem; interweaving and causing unpredicted new problems. These dispersed policy aims and agendas exponentially increased the probability of unintended consequences that easily took on a life of their own.

In an interconnected environment, policymakers have difficulty achieving the results they want and have trouble avoiding outcomes they do not intend. A primary reason for inevitable deviation is the lack of agreed upon goals among stakeholders, upfront. This goal-oriented focus entails a shift from problem solving to solution building. Strategic thinking becomes the critical conceptual skill. Unfortunately strategic, future-oriented policy thinking is not necessarily an easy process and identifying future consequences of policy choices can be difficult. Extrapolations of present trends can be misleading. The seriousness and intensity of existing problems tend to filter perceptions of future issues.

Without clear goals, policy decisions as large as restructuring a regulated industry, tend to become overwhelming to the agencies charged with their design. Systemic change is a process that looks at the dynamics and interconnections of the market as a whole and designs regulation around a clear set of goals. Looking at the potential goals of various stakeholders reveals the different and oftentimes conflicting goals:

<u>Consumer motivation</u>
1. Lower prices without volatility (stable, predictable bills)
2. Provide reliable service (lights are always on)
3. Benefit from better value-added services
4. Improve the environment

Political motivation
1. Lower electricity prices
2. Avoid job losses
3. Remain “green” regarding environmental protection policies

Technical motivation
1. Ensure the reliability of the electrical system
2. Administrative feasibility (reduce the complexity of handling transactions)
3. Efficient use of resources by producers and consumers
4. Spur innovation

Financial motivation
1. Provide regulatory efficiency and clarity to attract needed capital for new investment
2. Provide new services to customers to opening up new avenues of profits

Policy decisions using a systemic approach would view the system in totality, look for key bifurcation points using key questions as a filter such as:

1. How does the system react in crisis situations?
2. What changes can be put in place to insulate consumers from the effects of particular crises?
3. Is volatility a necessary and wanted part of efficient markets and does it really promote the best long-term interest of the consumers.
4. Are there policy solutions that are desirable in all circumstances or are there conditional policy solutions that are appropriate only if certain conditions present themselves.

Governing within a highly interconnected complex system requires regulatory bodies to become adaptive organizations. Adaptive organizations are geared to the flexible process of continuous search and modification which is the essence of planning at the higher levels of ‘futures-creative’ planning, namely the level of strategies and policies (Jantsch, 1972). Tactical planning and action aimed at well-defined targets may still benefit from a pragmatic approach. However, to deal flexibly with a multitude of strategic and policy options often aimed at resolving conflicting goal, a more systemic approach is advised. A systematic consideration of high-level objectives can be translated into a variety of tactical targets and associated actions. A wide spectrum of feasible solutions can be filtered through the proposed system framework and policy makers can investigate the possibility of satisfying a number or system criteria.

In order for a new governing approach to emerge, governmental ethics must also extend beyond the narrow constraints of intra-organizational accountability and the functions of separate independent actors. In the new order of open distributed systems, policy makers may fear stimulating uncontrollable ripple effects and deliberately contract their sphere of action. This leads to segmented and limited policy action. Policymakers now need to take on larger time horizons and an expanded set of ethical obligations. The long-term consequences and externalities of the system design and subsequent policy decisions must be taken into account.

Conclusion:

The development of well-functioning competitive electricity markets is a work in progress. Joskow describes the transition as plagued by problems and disappointments and certainly the recent blackout on the East Coast provides empirical evidence to his analysis.

> In California, the combination of market design imperfections, market power problems and poor federal and state policy responses has managed both to increase retail prices and leave utility and merchant generators financially crippled. The performance of retail competition programs has been disappointing almost everywhere, especially for residential and small commercial customers. Imperfections in retail competition program curtailed investments in new generating capacity and investment in transmission capacity has stagnated while network congestion has increased. This in turn has increased local market power problems and complicated the smooth operation on wholesale power markets. The transmission system remains fragmented with too many system operators relying on incompatible scheduling, transmission pricing and emergency management mechanisms (Joskow, 2003, p. 59).

The current view of 'living systems' such as humans and their associated social systems has re-emphasized the need to create research methodologies focused on properties and processes of systems that are in continual motion. Social systems are inherently dynamic, interlinked and self-organizing. Humans have the unique ability to analyze situations, be influenced and change their behavior, making outcomes highly unpredictable.

The electric utility industry is undergoing monumental change on a global base. For the most part this change is in its embryonic stage and due to the number of variables in flux - the entire system needs to be studied in a holistic manner to garner any meaningful analysis of the situation. The systems approach to finding patterns in apparent chaos is highly suited for this challenge. The subsequent use a system of dialectic feedbacks serves to both test the accurate interpretation of the situation and provide direction for the establishment of concrete action plans. For in real life, it is not an isolated group of variables that unlocks a 'magic formula' and solves generalized problems, it is the intersection of a group of interested people within a changing environment that really causes change.

References

Bay Area Economic Forum. (2002) *California's Energy Future: A Framework for an Integrated Power Policy.*

Bertalanffy, L., (1968) *General Systems Theory* (New York, George Braziller).

Borenstein, S.,J.B. Busnell et al., *Diagnosing Market Power in California's Deregulated Wholesale Electricity Market,* University of California Energy Institute, Berkeley, 2001.

Brown, Jonathan (2003) *"Electricity Use in California: Past Trends and Present Usage Patterns."* Energy Policy vol. 31.

California Independent System Operator (2002), *Market Design 2002 Project (MD02),*

Commission, U.F.E.R. (2001) *"Order on Rehearing of Monitoring and Mitigation Plan for CA Electric Markets."*

Commission, U.F.E.R. (2001) *"Order Establishing Prospective Monitoring and Mitigation Plan for CA Electric Markets."*

Commission, U.F.E.R. (2001) *"Commission Adopts CA Price Remedies Aimed at Fixing Malfunctioning Electric Markets."*

Congressional Budget Office (2001), *Causes and Lessons of the California Electricity Crisis*.

Gharajedaghi, J., (1999) *Systems Thinking: Managing Chaos and Complexity,* (Boston, Butterworth Heinemann).

Hira, A. and Libardo, A., (2003) "*Does Energy Integrate?"* Energy Policy vol. 31.

Hirsh, R., (1999) *Power Loss* (Boston, MIT Press).

Hirst, E., (2001) *The California Electricity Crisis- Lessons for Other States*, prepared for Edison Electric Institute, July, 2001.

Hunt, S., (2002) *Making Competition Work in Electricity*, (New York, Wiley Finance).

Joskow, P., (2001) *"California's Electricity Crisis."* MIT November 28, 2001.

Laszlo, E., (1996) *The Systems View of the World* (Cresskill, NJ, Hampton Press).

McNamara, W., (2002) *The California Energy Crisis: Lessons for a Deregulating Industry,* (Tulsa, OK, Penwell Publishing).

Moore, A. and Kiesling, L., *Powering Up California: Policy Alternatives for the California Energy Crisis*, Policy Study no. 280 February, 2001, (Los Angeles, CA, Reason Public Policy Institute).

Smeloff, E., and Asmus, P., (1997) *Reinventing Electric Utilities* (Washington D.C., Island Press).

Sweeny, J., (2002) *The California Electricity Crisis* (Stanford, CA, Hoover Institution Press).

Taylor, J. and Van Doren, P., (2001) *California's Electricity Crisis: What's Going On, Who's to Blame, and What to Do,* Policy Analysis No. 406 July 3, 2001.

Weare,C., (2003) *California Electricity Crisis: Causes and Policy Options*, Public Policy Institute of California